

# Corrosion Control

by Dean Benedict

**E**veryone knows that atmospheric conditions have a corrosive effect on all metals. Even fiberglass and composites are subject to corrosion as a result of sunlight and air pollutants.

Aluminum, the primary material used in aircraft construction for ages, is susceptible to corrosion from air pollutants and is particularly sensitive to the salt-laden environments found in coastal communities.

Recently I had two King Air 90s in my hangar, both for the first time. One was a C90, which was ferried from Hawaii. I had known for months that it was coming and I worried about what I might find corrosion-wise from all the warm, salty air of the Hawaiian Islands. The other, an older E90, had recently relocated to my area from elsewhere in the desert Southwest. I am very familiar with how King Airs fare in a desert climate, so corrosion was pretty low on my list of concerns for this aircraft.

## Surprise, Surprise!

As we progressed through the inspection checklists on the Hawaiian C90, I was shocked to find it was essentially corrosion-free! The inside of the engines looked like new, and we didn't find one speck of corrosion on the airframe. How could this be? Well, the maintenance manual has several sections directed toward King Airs operating in highly corrosive environments. The operator of this C90 had followed those instructions to a "T," and with great results. I might add that this C90 was built in 1980, so it was no "spring chicken," making its corrosion-free condition all the more impressive.

The E90, on the other hand, did not fare so well in the corrosion department. As we worked through the

phase checklists, we found corrosion at nearly every turn. We found it on the spar caps and at the skin joints that meet the spar caps, and inside the wing. The props were coming off for overhaul, but even before we removed them, corrosion was visible all over the hubs. The inside surface of the nacelle tank cover panels were riddled with it (by the way, this is a particularly vulnerable spot for corrosion on any King Air). The more we inspected, the more corrosion we found.

My original expectations were quite the opposite: I thought the C90 which had been based in Hawaii for years would have the corrosion problems I found on the E90 out of the desert. A little digging into the logbooks of the E90 revealed where some of these corrosion problems originated. Apparently this aircraft had been a bank repo at one point. It reportedly sat outside, somewhere in Georgia, for about two years with no maintenance. That really took a toll on this aircraft.

A King Air doesn't have to be a beach bum to suffer the effects of a salt-laden environment. It might be many miles inland but still subject to salty air, heat and humidity, depending on the prevailing winds and other local weather patterns.

## Remedies

The spar cap corrosion was a huge red flag on the E90. I immediately called in an NDT specialist for an eddy current inspection to assess the condition of the wing spars. Fortunately, for this King Air owner, all damage found was within limits and could be treated. We were able to peel the skins back and take out the corroded panels. We then removed the corrosion, treated those areas as directed by the maintenance manual and the



accepted standards of the industry. Before reinstallation, everything was sealed with zinc phosphate (once known as zinc chromate – that ubiquitous yellow-green paint found everywhere behind an aircraft's cosmetic surfaces).

Corrosion is like cancer – once it starts, if not treated, it will spread and become more destructive. Sometimes the only option is akin to surgery – if the affected areas are too corroded, they are cut out and replaced. Treatment is labor-intensive; replacement is ultra-labor-intensive.


## Preventative Measures

If your King Air operates regularly in an environment that promotes corrosion, I would assume your chosen maintenance shop is aware of this and takes the appropriate measures to combat corrosion when given the chance. But if they only see your aircraft during phase inspections, there are a few things you could do in the interim.

For example, if you are based on the coast and your sphere of operation is in that local area, consider compressor turbine washes at the end of every day. I know this sounds expensive and time consuming, but think of the huge amount of money it might save you down the road. Also, a good clean water wash (where permitted) will do wonders; de-ionized water is even better. Afterwards, spray every moving joint

with ACF-50 (a well-known anti-corrosive agent). If I were made of aluminum and lived on the beach, I would bathe in the stuff! Continual use of ACF-50 is probably what preserved the Hawaiian C90 so well.

I would definitely recommend using ACF-50 on the aforementioned panels that actually seal the nacelle tanks (underneath the panels in the wing), as they are particularly corrosion-prone. On 200s, 300s and 350s, the aux tanks have the same design and the same corrosion vulnerability.

Frankly, if you operate regularly in a challenging environment, get with your maintenance shop and ask them to print out the pertinent sections of the maintenance manual that addresses the conditions in which you operate. Review that information and do everything you can, in between scheduled maintenance appointments, to augment the preventative measures regularly taken by your shop. A well-maintained King Air is a beauty to behold and to fly. 

**About the Author:** Dean Benedict is a certified A&P, AI, and has almost 40 years of experience in King Air maintenance. He is president of Honest Air, Inc., which specializes in Beechcraft King Air maintenance and repair.

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